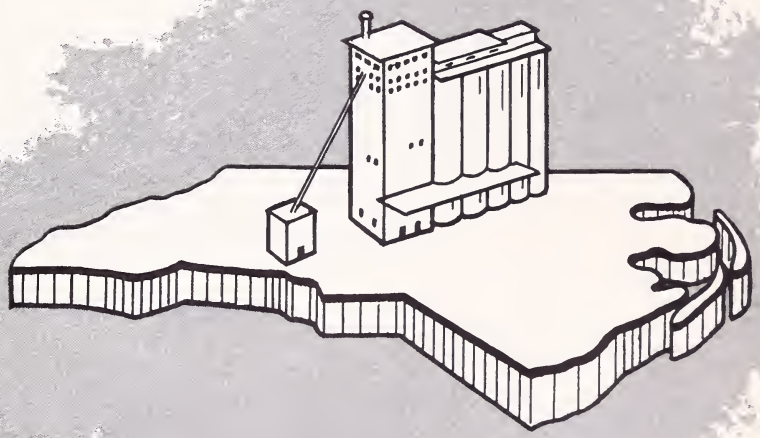
GRAIN MARKETING FACILITIES

in the Coastal Plains Area of North Carolina



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The study on which this report is based was conducted under authority of the Agricultural Marketing Act of 1946 (RMA, Title II).

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GRAIN MARKETING FACILITIES IN THE COASTAL PLAINS AREA OF NORTH CAROLINA

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SUMMARY

The 46 counties comprising mainly the coastal plains area of North Carolina produced 47,586,000 bushels of corn, 4,663,000 bushels of soybeans, and 1,558,000 bushels of wheat in 1951. It is estimated that 21,946,000 bushels of corn, 4,193,000 bushels of soybeans, and 809,000 bushels of wheat moved from farms into commercial channels from the 1951 production and that 25,640,000 bushels of corn was fed to livestock on farms.

In all counties the yields per acre and production of corn have increased greatly in recent years. Increases in production of corn have not been accompanied by corresponding increases in grain-consuming livestock. The production of corn and soybeans as cash crops is of major importance on farms in tidewater counties where tobacco and cotton are not produced. The greatest amounts of corn moved from the thousands of farms in the central coastal plains section where tobacco, cotton, or both are principal sources of income. The production and movement from farms of small grains is of minor importance in all sections of the area in comparison with those of corn and soybeans.

In tidewater counties corn and soybeans move rapidly from farms after harvest time. In the tobacco-cotton section corn either is sold as a minor cash crop soon after harvest, or it may be stored on farms until the determination is made that it is not needed for livestock feed.

Corn is stored on farms under conditions which promote its rapid infestation and damage by insects and damage by moisture in wet harvest years. It is estimated that in 1951 about 10,000,000 bushels of corn, which was eventually sold from farms, remained on farms for 1 month or longer, in addition to the more than 25,000,000 bushels fed to livestock on farms. This created a need for space to store 35,000,000 bushels. Adequate storage space was available to care properly for about 5,000,000 bushels of corn on farms, leaving about 30,000,000 bushels stored in facilities where it was subject to serious damage.

In 1953, a total of 62 elevators were located in the area. About half of them were of recent construction or had been altered within recent years to make them reasonably good to excellent grain-handling

units. Some were operated in connection with other enterprises, such as grain processing mills, cotton gins, hardware stores, or grocery stores. All elevators used their storage space mainly for assembling and moving grain, with very little off-farm commercial storage space available at any elevator in the area. The grain-handling efficiency of off-farm facilities in the area has increased greatly since 1948. Competition has become keen, and possible operating margins have narrowed.

The bulk of the corn sold moved by truck to processing mills in western North Carolina and other Southeastern States. Movement of corn and soybeans by water, rail, and truck to Norfolk, Baltimore, the Delaware-Maryland-Virginia peninsula, and other northern markets was heaviest immediately after harvest. It is estimated that in 1951 around 12,000,000 bushels of corn moved through commercial channels before January 1.

There are six suggested locations away from the most concentrated areas of production where low-cost grain assembly and shipping elevators would have a reasonable chance of being economically feasible, as determined from available generalized data. In the most concentrated areas of production the number of elevator units in their existing locations appears to be sufficient to provide good service to farmers. Most of these elevators, however, need improved types of equipment and facilities to receive and handle grain more efficiently. Most of such improvements would not require large additional investments.

The construction and operation of public grain storage elevators with grain storage space for rent to farmers or other users, and with storage rentals as the only income, does not appear to be economically feasible under 1953 construction costs, operating costs, and storage income rates. The most economical methods for securing off-farm storage space would be the construction of additional bins at existing good elevator units. If the site allows, additional bins may be constructed in line with existing bins at much less cost per bushel of space than if such bins were built as a part of a completely new elevator unit. The technical problems of preventing insect and moisture damage to bulk grains stored on warehouse floors have not been solved to the extent that flat storage can be recommended as practical and feasible for the average storage operator.

It is probable that the prevention of damage to corn caused by insects and high moisture content can be accomplished at lowest cost on farms. The reservoir of corn is on farms where corn is produced, and it is probable that such a situation will continue. By having adequate facilities to care for all corn stored on farms, farmers can participate in current storage loan programs if they seem advantageous, irrespective of whether the corn is for eventual sale or farm use.

It is estimated that the additional good storage facilities needed on farms to care for about 30,000,000 bushels of grain would cost about $18,000,000. The prevention of insect and high-moisture damage would

result in benefits of about $4,950,000 per year under 1951 volumes and prices. Most of these benefits would accrue to farmers. The narrowing of marketing margins, which in 1953 had been partially accomplished by greater efficiency in off-farm commercial facilities and practices, would lead to an estimated benefit of about $3,900,000, or 15 cents per bushel, on about 26,000,000 bushels of corn and soybeans moving from farms. If adequate farm storage were available, in most years farmers could secure at least 10 cents more a bushel for their corn by selling it later in the marketing season, when good quality corn has a good demand.

THE AREA STUDIED

The "coastal plains area," for purposes of this study, is made up of 46 counties comprising approximately the eastern half of North Carolina (fig. 1). 1/ The grain crops grown in the area are corn, wheat, oats, and soybeans. Soybeans are included in this study as a grain crop, because the facilities and equipment used in their production, harvesting, and marketing are similar to those used for small grains.

The coastal plains area is covered by a network of good highways, including local all-weather roads. All important population centers are served by railroad lines. At several points, such as New Bern, Wilmington, and Washington, navigable waterways penetrate inland a considerable distance from the coast, and the Inland Waterway affords good coastwise water transportation.

GRAIN PRODUCTION AND TYPES OF FARMING

The importance of grain crops in the area varies significantly from one section to another, because the types of farming vary widely from the upper coastal plains section eastward to the tidewater counties.

In the western and southern counties of the coastal plains area, cotton, tobacco, and corn are the principal crops. Tobacco is the most important crop grown in the entire area from the standpoint of cash income. Its production, however, is of greatest importance in the middle section of the area. No tobacco or cotton is grown in the lower tidewater sections in the eastern part of the area. In the tidewater sections, corn and soybeans are major cash crops, but early potatoes and other seasonal vegetables are also produced on some farms. Practically all tobacco farms produce corn as the major grain crop. The acreage of corn in the most important tobacco counties is as much as 2 to 3 times that of tobacco. The production of commercial peanuts is centered in Bertie, Hartford, and Gates Counties, where corn also is the major grain crop.

1/ All or part of the counties of Granville, Wake, Lee, Harnett, Hoke, and Robeson on the west are not in the coastal plains, but are included in this study.

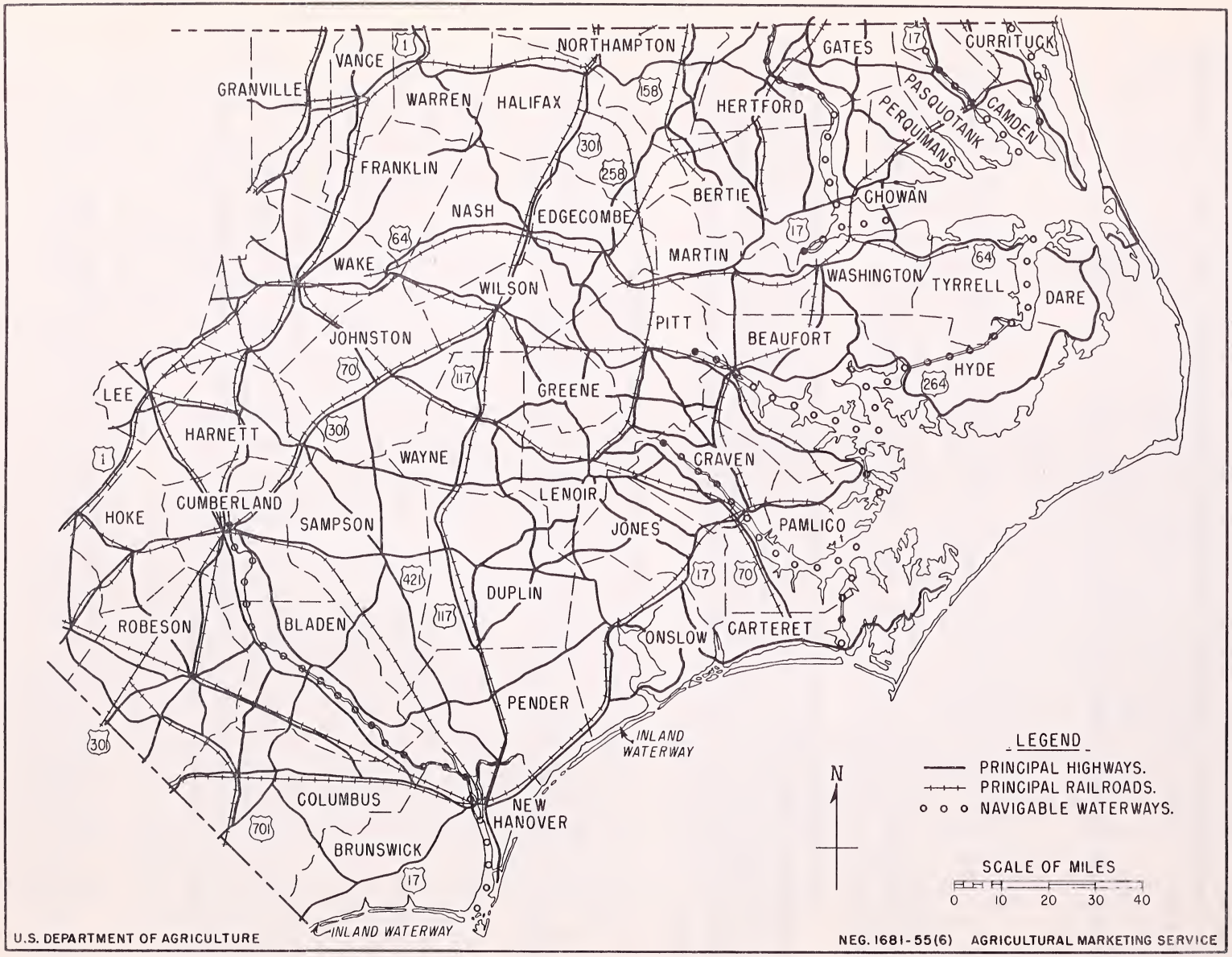

Figure 1.--Principal highways, railroads, and navigable waterways in the coastal plains area.

The production of wheat above farm needs is greatest in counties in the southwestern and western sections of the area, and the greatest production is in Robeson County. In no county is wheat a major cash crop, but many farmers grow small quantities for household use and as poultry feed.

Except in the southwestern counties, oats acreage in the coastal plains area is relatively small. Robeson County has the greatest production of oats in this area. Much of the crop is used as winter and spring pasture or is cut for hay. In North Carolina the greatest amounts of oats are produced in the Piedmont area.

Soybeans for beans are grown usually on those farms that also produce corn as a cash crop. In the middle coastal plains section, soybean acreage may be found on many tobacco farms. However, the crop is used primarily for hay and forage, and only small quantities are harvested for beans.

In 1951 the coastal plains area produced an estimated total of 47,586,000 bushels of corn, 4,663,000 bushels of soybeans, and 1,558,000 bushels of wheat. The area's corn production was about 70 percent of the total State corn production. The area also harvested about 94 percent of the soybeans produced in the State, but only about 17 percent of the wheat.

Trends in corn production have been upward since 1938 as the result of substantial increases in yields per acre. These increases have more than offset small declines in acreage. In many sections of the area, the average yields of corn per acre have doubled and tripled since 1938. Good seed, improved cultural practices, and increased amounts of fertilizers have made yields of 50 to 60 bushels of corn to the acre rather common.

In the four northeastern counties where corn has been grown as a major cash crop for many years, soil types are well adapted to its production. Many farms in this locality are highly mechanized and have a comparatively large acreage of corn and soybeans per farm. The large volume of surplus corn production in the tobacco and cotton sections comes from small acreages on many thousands of farms. The use of adapted hybrid seed corn is not yet universal, and many farmers still do not use production methods which result in the highest yields per acre. Therefore, the production of both corn and soybeans in the coastal plains area will probably continue to increase.

Oats are produced primarily as a minor feed crop, with small amounts moving into commercial channels. In recent years, production of oats has increased considerably in the southwestern part of the area.

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HARVESTING METHODS

Corn

Corn is harvested during October and November. Usually it is pulled from the stalk with the entire husk remaining on the ear, or it may be snapped or slip-shucked from the stalk. The latter two methods leave the outer portion of the shuck on the stalk and the remainder of the shuck clinging tightly to the ear. Practically all of the corn produced in the area has a heavy husk that extends in some cases as much as 3 inches beyond the end of the ear. Compared to corn produced in the Corn Belt of the United States, the ear is somewhat shorter and smaller in circumference, but there are more ears to the stalk.

In the tobacco and cotton section, most corn harvesting is done by hand. In the tidewater counties and on other farms where corn is a major cash crop, mechanical corn picker-huskers are coming into common use. On many highly specialized cash grain farms, corn husker-shellers are being used, and the harvesting and shelling job is being done in one operation.

Soybeans

The harvesting period for soybeans also is during October and November. Grain combines for harvesting soybeans are used throughout the area. In the tidewater sections, where there are comparatively large acreages per farm, combines are usually owned by the individual farmers. However, in the tobacco-cotton sections, much of the harvesting is done on a custom-service basis. Since the crop, for the most part, moves directly to market after harvest, little or no farm storage is required.

Wheat and Oats

Wheat and oats are harvested during June and July, mainly with combines. Custom-service combining of small grains is common practice. In the past, most combines were equipped for bagging the grain, but in recent years there has been a trend away from this practice, and more bulk grain combines are being used.

The use of the grain combine has increased the problem of caring for small grains with a high moisture content, particularly wheat. Often the crop is harvested before it is fully ripe, or harvesting is started early in the day before the dew has fully dried out of the grain. This damp grain may heat and be severely damaged if it is stored as it comes from the field. Much time and the expense of turning and, at times, artificial drying could be saved if the grain were allowed to dry in the field.

MOVEMENT FROM FARMS

Volume of Movement

To determine the volume of corn moving from farms, the feed requirements of the respective livestock on farms in 1951, by counties, were calculated on the basis of approximate farm feeding practices. The total grain needed on farms was subtracted from the total production. The remainder was an approximation of the grain moving off farms. In those few counties that produced significant quantities of oats as grain, such production was considered as an on-farm feed supply. The amount of oats and wheat utilized for feed was quite small compared to the volume of corn available for this purpose. It was estimated that the following amounts of corn were consumed by livestock on farms in the area during the year following the corn harvest of 1951:

	Bushels
Horses and mules	6,054,000
Hogs	17,646,000
Dairy cows	2,208,000
Beef cattle	369,000
Poultry	5,391,000
Total	31,668,000

Available data and information indicated that commercial feed was purchased by farmers in the area in an amount equivalent to approximately 6,028,000 bushels of corn, and that most of this feed did not originate in processing mills in the area. It was assumed, therefore, that this imported feed replaced area-grown corn as feed for farm livestock, thereby releasing an equivalent amount of corn for movement off farms. Some corn moved from one farm to another in the same neighborhood and did not enter commercial channels. This amount was estimated to be offset by the volume of oats that was used on farms as livestock feed.

With a corn equivalent feed requirement of 31,668,000 bushels and with 6,028,000 bushels of this released through commercial feed purchases by farmers, the net corn requirement for feeding purposes would be 25,640,000 bushels. The area production of corn in 1951 was 47,586,000 bushels. By deducting the net feed requirements from the total corn produced, it was estimated that 21,946,000 bushels, or about 47 percent of the total crop, moved into off-farm commercial channels. The estimated amounts moving from farms are illustrated, by counties, in figure 2 and are shown in appendix table 1.

The number of livestock per farm in the northeastern corn sections is comparatively small, and as much as 85 percent of all the corn produced on many farms in this section may move into commercial channels after harvest. In the major tobacco and cotton sections the increases in yields

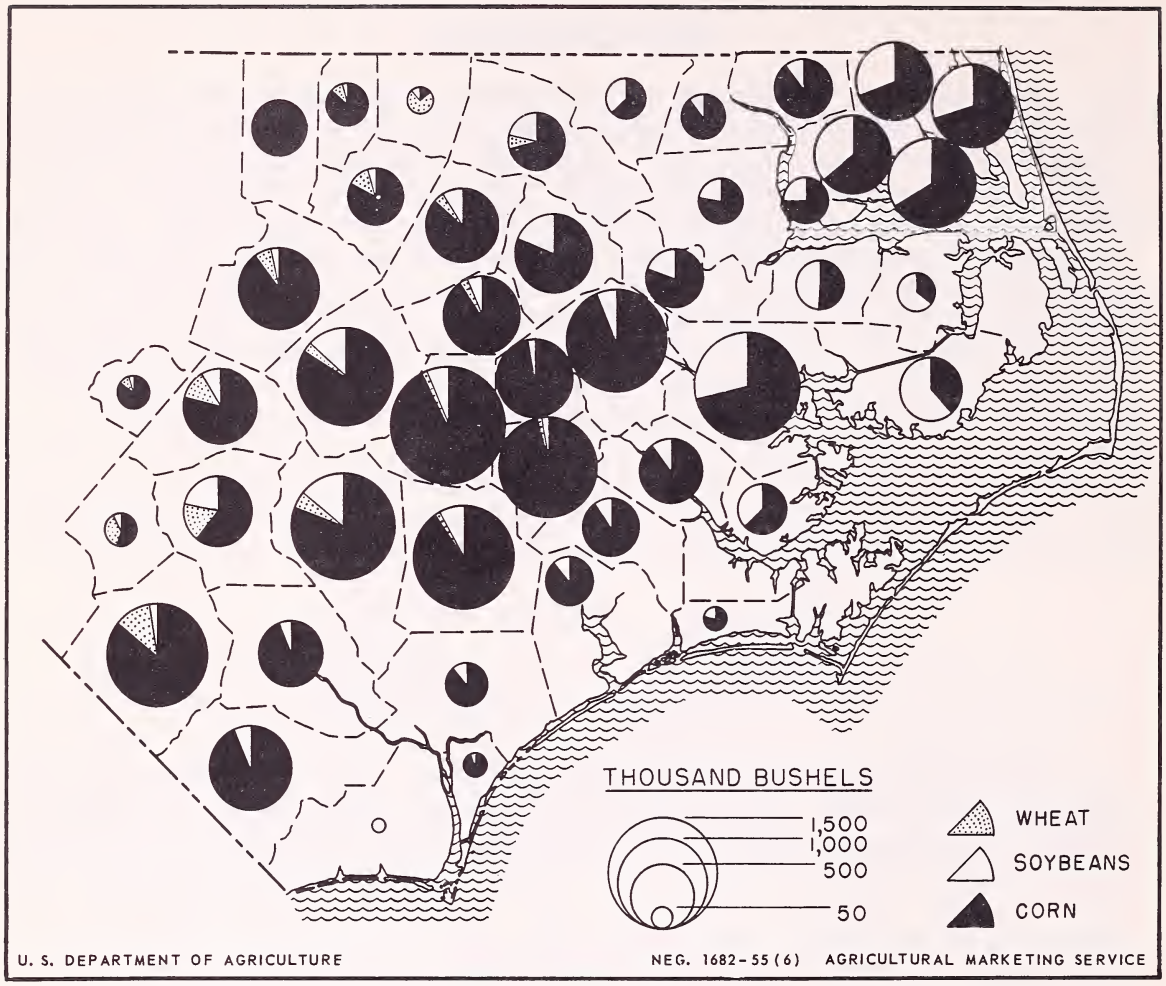

Figure 2.--Grains moving from farms in the coastal plains area, 1951 crop.

of corn per acre have not been accompanied by corresponding increases in corn-consuming livestock. Therefore, much of the increased production has not been consumed on farms, and this has resulted in increased movement into commercial channels.

There is a relatively good demand for new corn, mainly white, for milling in August and September, when the supplies of old corn are depleted or unsuited in quality. During the last half of September and most of October, large quantities of "wet" corn, having a moisture content of as much as 30 percent, is picked, shelled, dried in off-farm commercial driers, and moved to mills in the Southeastern States. Premiums paid for this new corn continue until field-dried corn is available to fill this demand. In the northeastern counties it is estimated that in some years as much as a third of the total corn crop may move off farms under this type of operation.

During the 1951 crop year, the yield of corn was around 31 bushels per acre. This yield resulted in a movement from area farms of about 22 million bushels. Due to drought and other causes in 1952, the yield per acre for the State was only 25.5 bushels, resulting in an area production of approximately 38 million bushels. Data indicated that in a low-production year, such as 1952, a minimum of 16 million bushels moved off farms into commercial channels. In a high-production year, such as 1950, as much as 26 million bushels might move off the farms. On those farms producing corn as a cash crop, the amount moving from farms tends to be directly proportional to the decrease in production. Obviously, variations in yields per acre from one year to the next greatly affect the amount of grain moving into commercial channels in the area.

The individual county data concerning movement from farms cannot be used as an accurate reflection of the importance of the corn enterprise on individual farms in the counties. The counties vary too widely in area and number of farms. For illustration, the 4 northeastern counties of Currituck, Camden, Pasquotank, and Perquimans are all small in area, and in 1950 had a total of only 2,751 farms. In 1951, these 4 counties produced 3,111,000 bushels of corn, of which 2,267,000 bushels, or about 73 percent, moved from farms into commercial channels.

In the same year, Johnston County in the tobacco section had about 8,000 farms and produced 2,795,000 bushels of corn on a larger acreage than the total of all these 4 counties. But only about 35 percent of the corn produced, or 982,000 bushels, moved into commercial channels. Johnston County is typical of much of the tobacco-cotton section of the area. In Johnston County around 120 bushels moved from the average farm, as compared to about 800 bushels moving from the average farm in the northeastern counties.

Very few soybeans harvested as beans are used as livestock feed on farms in the area. They are grown primarily as a cash crop to be sold as soon as possible after harvest. The greatest quantities of soybeans move from farms in the eastern tidewater counties where they are grown usually on farms that also produce corn. In the tobacco-cotton section, comparatively small amounts are harvested as beans. It is estimated that 4,193,000 bushels of soybeans moved from area farms into commercial channels from the 1951 crop. The volume of movement by counties in relation to other grains is shown in figure 2, and data by counties are shown in appendix table 2.

The production of wheat in the area was estimated to be 1,558,000 bushels in 1951, and the greatest production was in the southwestern and western counties in the area. It is estimated that 809,000 bushels of wheat moved from farms in 1951, and the greatest volume moved from farms in Robeson, Cumberland, Harnett, Sampson, Warren, and Wake Counties. The volume of wheat movement in comparison to that of other grains is illustrated in figure 2, and the data by counties are included in appendix table 2.

Season of Movement

The peak seasonal movement of grains from farms varies widely within the area and by crops. In the tidewater counties, where corn and soybeans are major sources of farm income, as much as three-fourths of the total production may move from farms promptly after harvest. On many farms the entire production of corn and soybeans may be sold at harvest time, and commercial feeds are purchased to meet the feed requirements of the small numbers of grain-consuming livestock. In the tobacco-cotton and peanut section, where livestock production is a more important item of farm income, corn has a much more extended marketing period. Many farmers sell their corn soon after harvest, when it becomes apparent that they have a surplus above their livestock needs.

In counties with a comparatively high percentage of tenancy, such as those with tobacco farms, the tenants may produce and sell corn to get part of their cash income. Generally, such tenants have comparatively small numbers of livestock, and they tend to sell their corn as soon as possible after harvest. The effect is an increase in the volume of corn moving into commercial channels at harvest or very soon thereafter.

Wheat sold from farms moves into commercial channels soon after harvest. The wheat remaining on farms is in small lots per farm and is used both for farm family consumption and farm poultry feed.

DESCRIPTION OF ON-FARM STORAGE FACILITIES AND PRACTICES

It was found that the only facilities on farms specifically designed for the storage of corn were structures of the ventilated-crib type. Some cribs had overhanging roofs over slatted sides, or the sides were wire with a wooden floor. The entire construction was conducive to ventilation for the drying of corn in the husks. The foundations for these structures were either wooden or rock posts to keep them off the ground, and in some cases concrete foundations were used. A high percentage of corn was stored on barn and shed floors, in rooms in abandoned tenant houses, in tobacco houses, and in any other available building. On most farms corn was not shelled before feeding to the livestock, and farm storage of shelled corn was rare.

Most farmers sold their soybeans as soon as they were harvested and did not store them on farms. The relatively small amounts of small grains utilized on farms were usually bagged and stored on barn floors or in other protected locations.

Few farms had storage facilities good enough to qualify for Commodity Credit Corporation farm grain storage loans. Metal storage tanks for shelled corn, wheat, and oats were observed in the southwestern section of the area, but very few farms had such facilities. For the area as a whole only a small percentage of farmers participated in the Commodity Credit Corporation farm grain storage program, and the opinion was expressed in many counties that inadequate farm storage facilities was one reason for the lack of participation. It is estimated that reasonably adequate facilities were available on farms in the area in 1951 to store and care for about 5 million bushels of corn.

DESCRIPTION OF OFF-FARM FACILITIES AND PRACTICES

In 1953, a total of 62 elevators were located in 29 of the 46 counties in the coastal plains area. In the remaining 17 counties there were no elevators. In this discussion, an elevator is assumed to be a facility permanently located at a specific point with at least one or more items of equipment for receiving, handling, and loading out grain. The distribution of these elevators within the area and their approximate geographic locations within the individual counties are shown in figure 3.

The types of equipment used in these elevators varied widely. At one end of the range, unhusked corn was shoveled from a farm truck into a small pit or hole in the floor and moved by gravity or mechanical drag to a small-capacity husker-sheller. From there the shelled corn was moved into a temporary wooden bin or directly into a truck.

At the other end of the range was the modern, efficient unit for receiving, handling, storing, and shipping any type of grain. These units were completely mechanized, starting with a truck lift and ending with loading out by gravity chute. In these elevators the following pieces of equipment were used in sequence: (1) Truck lift, (2) dump pit, (3) drag, (4) husker-sheller, (5) blower, (6) chute to boot pit, (7) elevator leg, (8) leg head, (9) distributor, (10) metal chute, (11) storage bin, and (12) chute to truck. In addition to these items of equipment, a magnetic trap for scraps of metal sometimes was installed at the drag outlet to the husker-sheller. Automatic scales, in some instance, were installed after the blowers or in the flow of grain after reaching the distributors. In some elevators, cobs were blown into bins and the shucks were blown into sheds where they were baled. Certain elevators ran their cobs directly through hammer mills, and the ground cobs were blown into bins or mixers to be used as the base for livestock feed mixes.

The grain storage capacity of the 62 elevators ranged from as little as 3,000 bushels to as much as 500,000 bushels, with a combined storage capacity of about 4,500,000 bushels. Grain storage tanks were constructed of wood, steel, and concrete, steel tanks being the predominant type. Most of the storage structures were of the vertical type. However, a few horizontal-type structures were found. One elevator had 2 horizontal-type storage bins of 200,000-bushel capacity each. Many elevators that used vertical steel tanks for grain storage did not have head houses over the bins, leg head, distributor, and grain chutes. This equipment was encased in steel and was weatherproofed. Usually the leg was also encased in a weatherproof steel box and the grain was fed to the leg boot by underground screw conveyors.

In a unit of this type only the grain receiving operation was housed. All elevators had roofs over the dump pits, corn husker-shellers, feed mills and mixers, automatic scales, and other equipment. In practically all of the elevators, the grain storage space was used for operating stocks and not for long-time storage.

There has been a revolutionary change in the types and qualities of off-farm grain facilities in the area since 1948. Previous to that time, most of the off-farm facilities available to farmers were the inefficient units in which a high percentage of the grain movement was a hand-labor operation. The bulk of the shelled corn was sacked at the receiving point

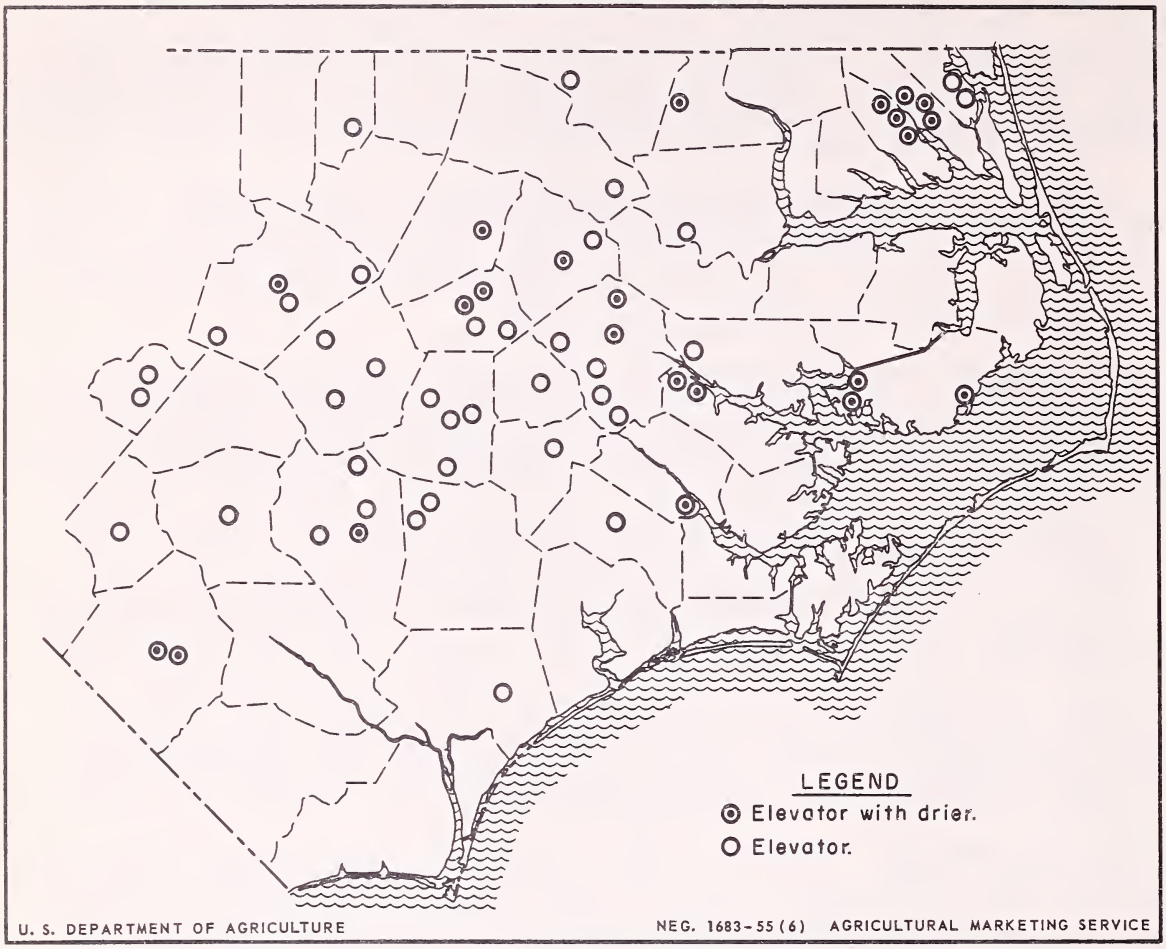

Figure 3.--Approximate location of elevators in the coastal plains area of North Carolina, 1953.

and moved to mills and other buyers. Two or more men with scoop shovels were considered a necessity in the corn assembly and shelling operations. Ear corn was purchased at farms by truckers who used large baskets of undetermined volume as a means of measuring the amount bought. Prices received by farmers were the result of day-to-day bargaining, and quality was apparently a minor consideration.

One important factor leading to the improvement of facilities used in the marketing of grain in the area has been the efficient operations of a few large grain companies. These companies have constructed or acquired efficient elevators similar to those which have proved necessary to do an efficient grain-handling job in other parts of the United States. They compete with each other and with other local elevators. Because a large part of the surplus grain from this area moved into other areas to the north and south in competition with surplus grains from other States, prices paid for grain assumed some relationship to national grain prices.

To avoid the high labor costs and inconveniences associated with handling grain received in bags from farmers, discounts were applied by the purchasers to grains so received.

The necessity of selling on a graded basis led to buying from farmers on a graded basis. Buying on a graded basis led to a refusal by many elevators to accept highly damaged grain from farmers, because it was not marketable. Local grain merchants were forced to meet this competition in order to remain in business. They could meet it only by having similar labor-saving facilities and using low-cost methods of handling.

Fortunately, in the grain-handling business a comparatively small elevator can be as efficient as a large one. In many cases, a small elevator has a better chance of success than a large one because of the smaller quantity of grain that is required to pay the costs of operation and to amortize the investment. In the coastal plains area the large-volume operators with their larger facilities provided a stable market as second receivers from many country elevators. These operators thus eliminated the difficulties of the small operator in selling grain to distant markets.

DEFECTS IN THE MARKETING SYSTEM

For the purposes of this study, the marketing of grains includes the handling and storage of grains fed to livestock on farms and the movement of grains off farms for sale.

Defects in On-Farm Facilities and Practices

The most serious defect in the entire grain enterprise in the area is the lack of adequate facilities and practices for the storage and care of grain on farms. Corn is stored on shed and barn floors and in other types of structures where it cannot be protected from insect damage. Corn becomes infested with insects in the field if not harvested promptly after maturity, and is stored in structures already heavily contaminated with insects carried over from previous years. Some of these insects migrate to new corn in the field. Opinions were expressed that the long, tight husk was a hindrance to effective fumigation and did not materially retard insect infestation in the field or in storage.

On many farms, corn was stored in structures where damage by rodents was high. In wet harvest years, corn was subject to serious moisture damage, because it was piled in farm structures not suitable for air drying. Small grains were sacked and piled on barn floors and other areas where protection from insects and rodents was impossible. It is estimated that at the level of production in 1951, there is a need for adequate space to store about 35,000,000 bushels of corn on farms. A maximum of about 5,000,000 bushels of corn was stored in reasonably adequate farm facilities, leaving a need for additional good facilities to store 30,000,000 bushels.

Defects in Off-Farm Facilities and Practices

The most serious defect in off-farm facilities was the lack of adequate equipment to render efficient service to farmers in receiving grains. Dump pits were so small or the capacity of the drags from the dump pits was so low that unloading trucks was a slow process. Many

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receivers had no truck lifts, and the grains were shoveled from the trucks by hand. Ear corn husker-shellers were of too low capacity. Dump pits, many of them of the hopper type, were located at places where excessive backing and turning was necessary to get them into position to unload.

Many husker-shellers and their connecting drags and dumps were enclosed in structures that were too small and where dust and trash accumulation was a health and fire hazard. Defective drags, husker-shellers, and other old equipment caused many breakdowns. At several receiving units the equipment had been in operation many years, no major improvements had been made, and the receiving capacity had not been increased. However, the farmers had greatly increased their off-farm marketing of corn.

Many of the elevators in the area have been modernized within recent years, and many items of new equipment have been installed to greatly increase grain handling efficiency. However, at many elevators good-capacity equipment had been installed in line with old equipment. The old equipment, with its low capacity, was a bottleneck in the rapid flow of grain, and the overall capacity of the entire unit was not increased by the new equipment. Certain elevators had good-capacity shellers and legs, but low-capacity dump pits and drags. Many elevators had completely new equipment for receiving, moving, and storing grain, but did not have corn husking-shelling capacity great enough to utilize the good equipment efficiently. Many bins were not hopper-bottomed and required hand-labor for emptying.

Certain new country assembly elevators had been constructed in recent years having too small storage capacity and too few bins. Inadequate storage space made frequent shipment away from the elevator a necessity if grain was to be received in volume from farmers. Lack of sufficient bins prevented the segregation of different qualities of grains.

Defects in Pricing

Corn was received at elevators in the ear with partial or complete husks. At many elevators, the considerable variation in shelling-out weights which exists between lots of ear corn grown under different conditions was not recognized as a factor in price determinations. At many elevators good-quality corn brought about the same price as insect-damaged corn. The buying of corn on a reasonably accurate grade basis was practiced only at the largest elevators not operating as first receivers from farmers. The normal day-to-day price-making factors used in areas having an efficient grain marketing system were not evident, especially at country assembly elevators.

GRAIN STORAGE FACILITY REQUIREMENTS

On Farms

No specific estimate can be derived from data obtained in this study on the volume of storage space which it would be economically feasible for farmers to install on farms to care for their stored small grains. To arrive at reasonable estimates of the amounts of small grain storage needed on farms, it is necessary to have a detailed study of farm feeding practices and movement of such grains from farms in specific sections. The need for such storage is far overweighed by the major need of facilities for the storage and care of corn, even in the few sections producing considerable amounts of small grains.

As shown previously, out of more than 47 million bushels of corn produced in the area in 1951, it is estimated that about 25 million bushels remained on farms and was used as livestock feed. The seasonal movement of corn indicates that around 12 million bushels moved from farms at harvest time or within 1 month thereafter. It is estimated that the remaining 10 million bushels which moved from farms remained on the farms where produced for a month or longer.

It is estimated that suitable facilities were in existence on farms to store and care for about 5 million bushels of corn in 1951. Thirty-five million bushels of corn was stored on farms for livestock feed or stored temporarily a month or longer before marketing. It is therefore estimated that in 1951 there was a need for additional facilities to store and care for 30 million bushels of corn on farms. To store 30,000,000 bushels of corn (shelled basis) would require at least 60,000,000 bushels of space for that volume in the ear with a partial or complete husk. One bushel of ear corn occupies about double the space occupied by a bushel of shelled corn.

Several factors are important in determining the most practical and effective type of corn crib or other structure to store ear corn. The structure should allow for air-drying and also for enclosure so that fumigation can be effective. Farmers will probably continue to store their corn in the ear on farms because that method is most practical for them. One type of storage structure recommended by State agencies as meeting the requirements in a practical way is an altered form of the common ear-corn crib. When well-fitting hinged sides are added to be fastened down over the slatted or wire sides of the crib, and when the original construction of the floor and ends is reasonably airtight, effective fumigation for insects is possible. The hinged sides can be propped open for effective air drying, and they also help to protect the stored corn from rain. This type of structure can be built by farm labor. Its cost is estimated at less than 30 cents per bushel of space at 1953 prices for lumber and other materials.

Off Farms

As previously shown, it is estimated that elevators in the area had about 4,500,000 bushels of storage space in 1953. Practically all of this storage space was used as operating storage to facilitate the movement of grain, and very little space was used for the long-time or public storage of grains. Individual elevators built in the area in recent years have included as much as 500,000 bushels of storage, but this storage has been used for grain movement operations of individual firms or for storage of grain stocks for processing.

No elevators were observed in which the operations of the grain businesses were being seriously hampered by the shortage of operating storage space. Truck transportation of grains away from elevators was readily available in most sections of the area. Use of truck service reduced the need of the individual elevator for large storage stocks on hand awaiting transportation. It is therefore concluded that elevators in the area in 1953 were not in serious need of additional operating storage space above their storage capacities to carry on their grain merchandising businesses efficiently. It is probable that existing operating storage was adequate for the market movement of the 26,000,000 bushels of grains estimated to have moved off farms from the crops of 1951.

Many farmers producing grains could be well served by having off-farm commercial storage space available in certain years so that they could participate in the Commodity Credit Corporation warehouse storage loan program. Relatively few farmers have participated in this program, because there are no elevators available who do this type of business in any substantial volume. It is possible that as much as 5 to 10 million bushels of corn might be stored by farmers under this program in years of favorable price relationships. However, from the standpoint of the investor in an elevator, the chances of profits apparently have not been sufficient to lead to the financing and construction of elevators to carry on this type of operation.

TYPES AND LOCATIONS OF OFF-FARM FACILITIES NEEDED

In arriving at judgments concerning the need for grain marketing facilities in specific locations in the area, all counties were examined with respect to: (1) Amounts of grain moving from farms, (2) availability of facilities, and (3) the function of existing facilities in the marketing of grain. In no case is it suggested that existing facilities be abandoned, because the most economic procedure would be to improve the facilities being used. Although county boundaries are not significant in the movement of grain, counties are used to designate specific geographic sections of the total area. For the purpose of this discussion, the area is divided into county groups falling into three categories with respect to the need for or adequacy of off-farm grain handling and storage facilities.

Counties That Have No Elevators and For Which None Are Suggested

Counties that have no elevators and for which none are suggested are New Hanover, Brunswick, Carteret, Pamlico, Tyrrell, Martin, Dare, Chowan, Perquimans, Warren, Franklin, and Granville. The movement of corn and soybeans from farms in New Hanover, Brunswick, Carteret, Pamlico, Tyrrell, and Dare Counties is not sufficient to assure that a local handling unit would be economical. If production increases substantially in the future, it is possible that a local assembly point operation might become economically feasible.

Either because of their small area, their shape, or the volume of grain moving from farms, the counties of Martin, Chowan, Perquimans, Warren, Franklin, and Granville can be served by elevators located in surrounding counties. Chowan County is bounded on the west by the Chowan River, over which there is no bridge above that on U. S. Highway 17 on the south. The county does not produce great amounts of corn and soybeans, and the surplus tends to move towards facilities in Elizabeth City to the east. A small facility located in the western half of Halifax County to the east of Warren County would probably have a better chance of success than one located in Warren County. An elevator is now located in Vance County on the west of Warren County, so that surplus grains originating in Warren County do not have an excessively long haul to market.

Counties In Which At Least One New Facility May Be Needed

The counties in which at least one new facility may be needed are Bladen, Columbus, Onslow, Gates, Washington, and Halifax. All of these counties are located outside the central belt and outside the northeastern section described above. The corn and soybean production per unit of farming area in these counties is less than the production in the other counties of the coastal plains area.

Bladen, Brunswick, and Columbus Counties in the southern part of the area make up the largest section of the entire area which may not be served adequately by existing facilities. Only 4 elevators are located in this section, 3 at Lumberton in Robeson County and 1 in Whiteville in Columbus County. Three of these elevators have driers and are reasonably well-equipped. They function as first receivers and assemblers from farmers and to a limited extent as second handlers.

The absence of elevator facilities in the area composed of Brunswick, Bladen, and Columbus Counties seems to create a considerable marketing disadvantage to local grain farmers. All of these counties have considerable amounts of relatively nonproductive lowland, but they also include good-quality land that produces substantial quantities of grain, particularly corn. Producers in Brunswick County are obliged to haul to an elevator in Pender County or across Columbus County to Lumberton.

Producers in Columbus County haul to Lumberton, the only other outlet within a reasonable distance being a small elevator in Horry County, South Carolina. Bladen County producers must haul to Lumberton on the west, to Fayetteville in Cumberland County, or to Clinton in Sampson County to the north.

Low-cost receiving, handling, and shipping elevators located at strategic points in the counties of Columbus and Bladen would have a reasonable chance of success. Grain production from the western part of Brunswick County could move to such a facility located in Columbus County, since the commercial production in the Cape Fear River lowlands in 1951 was not sufficient to justify an elevator in Brunswick County.

The elevators at Raeford in Hoke County, Fayetteville in Cumberland County, and Laurinburg in Scotland County (outside the area) are adequate to handle all commercial grain currently moving from farms located to the north and west of Lumberton.

There is no elevator in Onslow County, and the producers in this county must haul to elevators in Jones and Pender Counties, or to the elevator in New Bern in Craven County. A low-cost grain receiving, handling, and shipping operation could have a reasonably good chance of success if it were located toward the Duplin County line in Onslow County. It could serve farmers in the southeastern part of Duplin County as well as those in Onslow County. The elevators in Jones and Pender Counties and the two elevators in the northwestern corner of Duplin County are a considerable hauling distance away, and competition from those sources would be minimized.

Producers of corn and soybeans in Washington County are confronted with relatively long hauls to elevators in Hyde County; in Washington in Beaufort County, or in Elizabeth City. All three of these points have reasonably good facilities to render efficient service to producers. In 1951 it was estimated that about 300,000 bushels of corn and soybeans moved from farms in Washington County. Available information indicates that the production of cash corn and soybeans in the area south of Albemarle Sound may increase in the future. Should this occur, the increased volume may justify the establishment of a low-cost elevator in Washington County. However, if the bulk of this surplus production should come from large-scale farms using husker-shellers in harvesting corn, large transport trucks might move the shelled corn and soybeans to other areas, and the need for a local assembly point elevator might not arise.

In 1951 about 450,000 bushels of corn and soybeans moved from farms in Gates County. Most of this production originated on farms where peanuts also were grown as a cash crop. Approximately 90 percent of this grain was corn and 10 percent was soybeans. Farmers in this county hauled a large portion of their grain to Elizabeth City, the only other

outlet being a good elevator on the western boundary of Hertford County at Murfreesboro. A small country elevator might prove practical in Gates County at a central point with good transportation facilities, but its feasibility depends largely on the adequacy of elevators in nearby Elizabeth City and in Virginia.

Producers in Halifax, Nash, Franklin, and Granville Counties in the northwestern corner of the area have available one elevator in the southeastern end of Halifax County and another, with a drier, at Rocky Mount on the eastern edge of Nash County. Franklin, Granville, and Warren Counties have none. The elevator at Henderson in Vance County is an available outlet for surplus corn and soybeans from Franklin and Granville Counties and the western half of Warren County. However, many producers in this group of counties must haul their grain rather long distances to existing elevators. Therefore, a low-cost country elevator near the western border of Halifax County would seem to have a good chance of success. Movement of grain from farms in this trade area probably would be sufficient to support a minimum-cost facility that would render efficient service to farmers.

Counties Where the Need Can Be Met by Expanding and Improving Existing Facilities

Each of the following 28 counties had one or more elevators within its boundaries:

Camden	Vance	Lenoir	Pender
Pasquotank	Wake	Green	Duplin
Currituck	Wilson	Pitt	Sampson
Hertford	Lee	Beaufort	Cumberland
Bertie	Harnett	Hyde	Hoke
Northampton	Wayne	Jones	Robeson
Edgecombe	Johnston	Craven	Nash

Of the total of 62 elevators in the coastal plains area, 57 were located in these 28 counties in 1953. This group includes most of the counties in the area that produce comparatively large volumes of cash corn and soybeans. It also includes counties from which these crops move as major sources of farm income and counties from which corn and, to a minor extent, soybeans move from farms growing tobacco and cotton as major sources of income.

In the 3 northeastern counties there are 8 elevators: 3 in Camden County, 3 in Pasquotank County, and 2 in Currituck County. Some of these elevators function both as first receivers from farmers and as subterminals or second receivers from country assemblers. The grain handling and merchandising business in this section has been highly developed, and grain handling facilities are good to excellent. Two national grain companies have elevators in this section, and 6 of the 8 elevators have grain driers.

A comparatively high percentage of the "wet corn" operation originates in this section. Farmers in these 3 counties are under no serious handicaps with respect to marketing their corn and soybeans, insofar as availability of facilities is concerned. In 1953 the capacity of existing facilities was more than sufficient to take care of the volume of grains moving from farms. Any additional units of elevator facilities established in this section would be confronted with severe competition from experienced grain handlers with reasonably efficient operating units.

Starting with Beaufort County on the east, the counties of Pitt, Lenoir, Green, Wayne, Wilson, Johnston, Sampson, and Wake comprise a strip across the tobacco area having a relatively large movement of corn and soybeans from farms. Twenty-nine elevators were located in these counties in 1953, and 8 of them had 1 or more grain-drying units. The comparatively large elevators at Washington and Wilson, which function as first receivers from farmers and as subterminals or second handlers, are included in this total. The 29 elevators had varying degrees of efficiency, in accordance with their date of construction and the extent to which they had been modernized by the installation of efficient grain-handling equipment.

Hyde County had 3 well-equipped elevators, all of which had water transportation available. Robeson County had 3 elevators and the counties of Edgecombe, Lee, Harnett, and Duplin had 2 elevators each. The remaining counties in this group had 1 elevator each.

The locations of these elevators within the counties and in relation to elevators in adjoining counties indicate that farmers are not handicapped materially in grain marketing in these counties. Elevators are available within reasonable distances, and the amounts of grain moving from farms could be adequately handled by the existing facilities. No suggestion is made that additional elevator units are needed in these counties.

New facilities are suggested only for the fringe production sections that border the counties where the heavy movement of grain from farms is well established. From a long-time standpoint, the total amount of grain moving into commercial channels in an area must support the handling facilities at competitive margins. Hence, it is probable that in the area of concentrated production the point may have been reached where no additional elevators are needed. The numbers and locations of these units indicate that construction of any new units, except in the locations suggested, would be attended with many financial hazards unless the movement of grains from farms becomes much greater than it was in the relatively high production year of 1951.

The primary job to be done by elevators in this area is a "movement" job, not a storage job. Increasing the capacity of elevators to move grain is most economically accomplished by increasing the hours of

operation or increasing the capacity of handling equipment within the elevator. Building a completely new elevator may be the most expensive method and may be difficult to pay for when it is operated under highly competitive conditions. When a new elevator is built in the same area as a less efficient operation, it may create a situation where two elevators must be supported by an amount of grain that could be handled by either one. The inefficient elevator may be able to stay in business and meet operating costs with narrow margins because the facility has been paid for. In contrast, the new elevator must pay its operating and construction costs, compete with the other elevator for the available supply of grain, and operate on a comparable margin. Situations such as this may result in the failure of a new elevator.

It is estimated that, at the time of this study, about half the existing elevators had practically all the necessary equipment and facilities to make them reasonably efficient in receiving and handling grain. Some newly constructed or re-equipped elevators were excellent grain-handling units. It is estimated that about 25 of the elevators operating in 1953 needed new handling equipment and facilities of larger capacity.

The new equipment and facilities needed to render better services to farmers included larger dump pits, drags, and husker-shellers. Dump pits for small grain with adequate drags and legs were needed at many elevators so that bag handling of grain could be eliminated. These types of improvements could be made where they are needed without a large investment. Such improvements would result in more efficient and equitable service to farmers and substantially reduce the cost of operating the elevators.

Most Economical Method of Acquiring New Off-Farm Storage Space

The most economical method of securing off-farm grain storage space in the future, if the need arises, would be the addition of bins to existing elevator units. Such existing units already would have made the investments in facilities and equipment necessary to receive, handle, and ship grains. These investments would include storage space in bins necessary to do this job. If an existing elevator site has space for expansion, additional storage bins may be constructed in line with existing bins at a much less cost per bushel than if the new bins were built as a part of a new elevator unit. The added bins may be filled and emptied by the extension of existing conveyors, and equipment already in use can do the job of receiving, handling, and moving the grain to the new bins. If a grain drier is operated in connection with the existing unit, it can be used to serve the additional bins.

Available data indicate that at 1953 price levels the cost of constructing a good vertical-type elevator, including all equipment, would vary from $1.00 to $1.50 per bushel of space for an elevator having

storage space for 100,000 bushels of grain. An additional 100,000 bushels of storage space could be added to this kind of unit at a cost of 50 to 60 cents per bushel. This relatively low cost is mainly for bins, and the cost of extending the existing conveyors is the only equipment cost.

The new 100,000 bushels of space, if used for long-time storage purposes, would probably not require much additional labor. The increased operating cost for the entire unit would probably be due to some increases in cost of power and of repair and maintenance of equipment, which would be used during a greater number of hours. Since the cost of providing the additional storage space would be about 60 cents per bushel, an estimated 15 cents per bushel of storage income (including in and out charges) would pay for the addition rapidly. This assumes that the enterprise being carried on in the original 100,000-bushel elevator already is a going business and is paying for the original elevator investment.

In future years, in an area of expanding grain production, it might turn out that the added space would become more valuable in any one year for use as operating space than it would be for storage. If this space were added to an elevator which was operated in connection with a feed processing business, it could be valuable for use in storing working stocks in those years when it might not be fully or even partially used for public storage.

In recent years commercial storage of bulk grains on flat floors in warehouses has been increasing. The use of plastic covers for effective fumigation, fumigating the entire building in which the grain is stored, and other types of insect control measures have been tried. Some methods have been reasonably successful under specific conditions and some have not.

Whether the moisture content of large volumes of bulk grains can be successfully and economically controlled under a system of flat storage is a subject for further experimentation. In North Carolina the technical problems of preventing insect and moisture damage to grains stored in this manner have not been solved to the extent that such flat storage can be recommended at this time as practical and feasible for the average operator.

Relation of Harvesting Methods to Facilities

When determining the long-time need and usefulness of a local country grain assembly elevator, possible changes in the methods of harvesting and marketing corn can be of major significance in some areas. In local sections, such as in the northeastern cash corn area, the expanded use of corn husker-shellers may eliminate the need for a country assembly elevator to serve local farmers.

When it is accompanied by a large transport truck, the corn husker-sheller can do a complete harvesting, shelling, and hauling operation. In the northeastern area studied, corn is grown on rather large acreages per farm and on level land, and this situation favors the efficient use of this type of harvesting equipment. Yields per acre are usually high, so that a transport truckload can be accumulated in a comparatively short time with one or more husker-shellers. With this load of shelled corn, there would be no reason for the transport truck to stop at the local assembly point. The corn is shelled and is assembled, so that two of the principal functions of a country elevator have been performed.

Similar operations could become more prevalent in the tobacco area. On many tenant-operated tobacco farms the tenant has the responsibility of harvesting the corn crop. The livestock needs of the landlord are usually supplied from his share of the crop, and the excess over such needs is sold. The tenant, having little or no livestock, sells most of his share at harvest time. Under these circumstances, a husker-sheller operation with attending trucks has several advantages. The harvesting is done quickly, and the cost is paid by the tenant from the receipts of his share of the crop. The sheller mechanism records the bushels of corn harvested, and the three interested parties can easily arrange an equitable transaction. The operator of the husker-sheller may haul the shelled corn to the subterminal for the owners, or he may buy it at the farm for his own account.

The possibility that this one-operation method of harvesting and marketing corn will become more prevalent has a significant bearing on the need for a local assembly point elevator. This possibility should be given careful consideration if a new facility is being contemplated.

EQUIPPING AND OPERATING A LOW-COST GRAIN ELEVATOR

The needs for grain-handling facilities or elevators in various parts of the area have been discussed. In each instance, the primary job to be done is receiving and handling the grain and moving it on to further points in the marketing channels. It has been pointed out that these units should be started with as low an investment as possible but equipped with types and sizes of receiving and handling equipment that will allow for a low-cost operation and permit expansion (see figures 4, 5, and 6).

The equipment which would probably be necessary in a local elevator unit for receiving, shelling, and shipping corn, and some approximation of its cost, are illustrated in the following example:

Equipment and Installation	Approximate 1953 Cost Dollars
Moisture tester	475
Weight per bushel apparatus	180
Platform scale, 30 feet, 10 tons	750
Chain hoist truck lift	250
Dump pit	175
Drag from dump to sheller	250
Husker-sheller, including blower and motor	2,500
Leg, including boot, head and motor, and enclosure	2,000
Distributor	250
Metal bins: one 3,000-bushel capacity at $1,275	1,275
three 1,300-bushel capacity at $775	2,325
Metal chutes	250
Automatic scale	1,200
Installation cost and land	2,500
Total	14,380

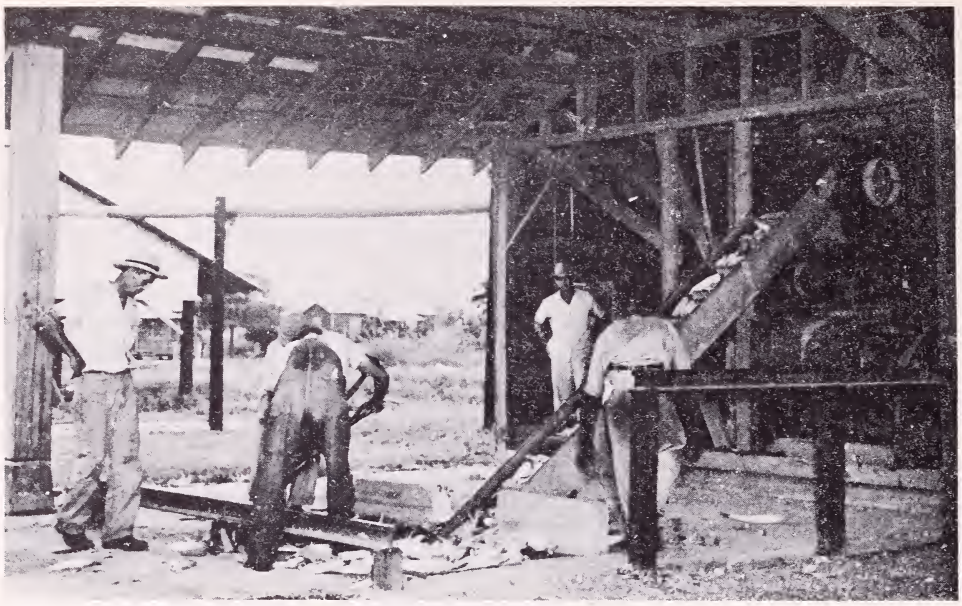

Figure 4.--Three men, with shovels, cleaning up after unloading a small truckload of ear corn. An inexpensive alteration of size of ear corn dump and the addition of a truck hoist could eliminate the need for at least two of these men.

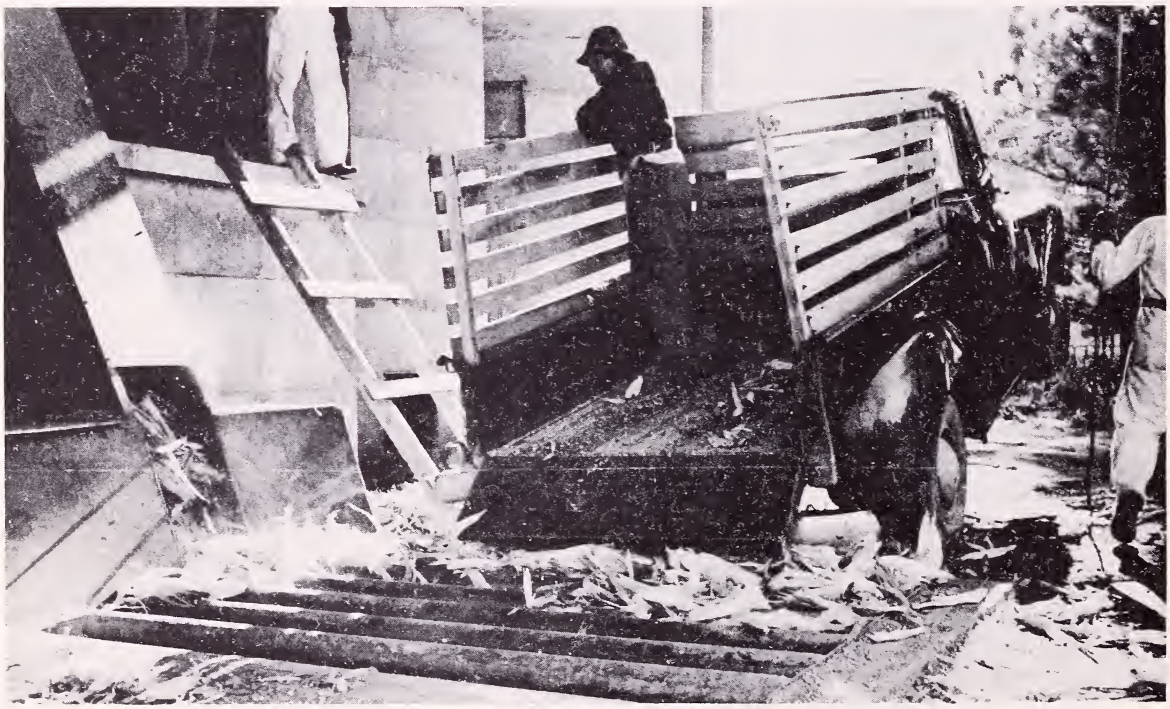

Figure 5.--Receiving ear corn mechanically at an elevator. Truck lift, dump grate over dump pit, encased drag to husker-sheller, and blower on platform practically eliminate use of labor. Concrete storage tanks in the background.

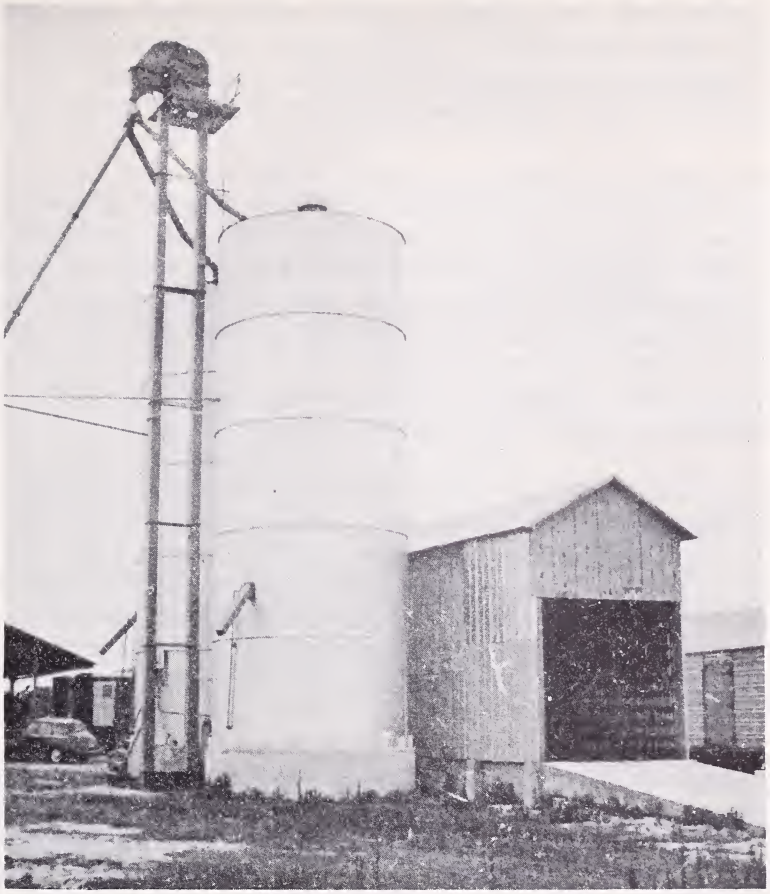

Figure 6.--The simplest type of elevator for assembling and loading out bulk grain. Grain goes from covered dump pit by underground conveyor to leg boot to encased head and distributor to truck or railroad car or to bins. Elevator is limited to one kind of grain at a time, either shelled corn or small grain and soybeans. An additional ear corn dump, drag, corn sheller, and blower would be needed to receive ear corn.

These costs are estimated on the basis of several prices quoted in 1953 by equipment manufacturers. The dump pit or ear corn dump would be constructed from lumber and not purchased as a unit. The leg head should be about 40 feet high to allow for gravity chutes to the proposed bins and to any future bins. Space on the site should be ample to allow for additional bins.

The platform scale is not large enough to weigh transport trucks loaded out, but the automatic scale should be installed in the grain flow to allow its use for this purpose. The automatic scale is necessary to serve farmers. The most equitable method of buying corn from farmers probably is by

determining the grade and weight after it is shelled. The determination of grade and weight of corn while in the ear at best can be only an approximation. The difficulty of securing a representative sample of ears and the variations in weight of grain in relation to weights of both cobs and husks make such determinations of doubtful accuracy.

The total amount of storage space in the 4 metal bins would be 6,900 bushels. The 4 bins would provide some flexibility in isolating white and yellow corn by grades. As the volume of receipts increases, the need for emptying bins through prompt out-shipment would become pronounced. The limitation in numbers of bins could become a much more serious factor in operations than the limitation in total amount of storage space. If it were practicable to construct or install 6 bins at a reasonable cost, the operator would have more flexibility in operations than with 4 bins having the same total capacity.

The leg and leg head and grain bin tops would be encased in sheet steel and waterproofed, and no overall structure would cover this equipment. This is common practice in good elevator units in the area and apparently has no major drawbacks. A shed-type cover would probably be practical over the ear corn dump, drag, husker-sheller, and automatic scale, and this roof cover would extend over the truck dumping area. This cover would allow for rainy weather operations and would protect the expensive equipment.

In many elevator units in the area, the husker-sheller installations were operating on second-floor levels. Their heavy weight and vibration in operation tended to loosen wooden joints in the structures and crack masonry walls. In this suggested installation, the husker-sheller can be fed by a short drag, the lower end of which could be below ground level. The husker-sheller need not be more than 3 feet above ground level, with the concrete foundation footings in the ground. At this level the shelled corn can move by gravity chute to the leg boot which should be at ground level or slightly below. This concrete foundation will minimize vibration, decrease noise, and reduce wear and tear on the husker-sheller, the most expensive single item of equipment installed.

This installation for receiving ear corn, with an investment cost of slightly less than $15,000, includes only those items necessary to an economic unit for this operation only. This unit could not receive any other grain. An additional grain dump for soybeans, oats, wheat, and shelled corn would probably be needed in most places in the area to receive all kinds of grains that move from farms.

The additional grain dump should be installed far enough away from the ear corn dump so that there would be no interference between trucks when both dumps are being used at the same time. The small-grain dump could be connected by a grain drag to the leg boot. With only one leg, small grain could not be received at the same time as ear corn. If

small-grain receiving is to be a substantial part of the operation, it might be advisable to install two dumps, drags, and legs originally, and to increase the number of bins. Also, in sections where the corn picker-husker-sheller is coming into use in corn harvesting, a small-grain dump and drag to receive shelled corn from farmers might be advisable in the original installation.

In the operation of the elevator installation described above, the bottleneck in the flow of grain would probably occur in the husker-sheller. All the equipment would be capable of moving grain at a faster rate than the capacity of the husker-sheller. It is estimated that the husker-sheller would handle about 200 bushels per hour if the husks were not too heavy and wet.

The yearly operating expense of this kind of unit, exclusive of the owner-manager salary, is estimated as follows:

	Dollars
Hired labor (1½ man years)	2,700
Power, lights	600
Maintenance and repairs	700
Miscellaneous	300
Total	4,300

It is calculated that the $15,000 investment would be paid for in 10 years; at 5 percent interest, the annual amortization payment would be $1,942. If paid for in 5 years, the annual payment would be $3,525. Therefore, for 10-year amortization, the total yearly expenses would be $6,242, and on the 5-year plan it would be $7,827, exclusive of any payments for management.

With an average capacity of 200 bushels of shelled corn per hour, 1,600 bushels could be received in an 8-hour day. Handling margins which could be charged equitably are difficult to estimate. The corn husking-shelling job is expensive, requiring heavy power and high-cost equipment. It has no counterpart in corn shelling operations in the Corn Belt. There the charge for shelling ear corn free from husks is about 2.75 cents per bushel plus an average overall handling margin of 6 cents per bushel. Unless a much more efficient husker-sheller is developed in the future than was used in the area in 1953, the shelling of unhusked ear corn might require a charge of at least 10 cents per bushel. Charges in 1952 for this operation were considerably higher than this at many elevators.

With a total annual cost of $6,242 for the 10-year amortization plan and a handling margin of 10 cents per bushel, exclusive of shelling charges, 62,420 bushels of shelled corn must be moved through the unit to meet expenses. With a movement of 1,600 bushels per day, of which

the unit would be capable, 39 days of operation would be necessary to pay one year's expenses. At 10 cents per bushel handling margin, 78,270 bushels of corn would be necessary to pay annual expenses and amortization costs over the 5-year period, or forty-nine 8-hour days of operation during a year. If it were possible to buy enough corn from farmers to keep the unit busy during 90 full days out of the year, the net annual income to management under the 10-year investment amortization plan would be $8,158 and under the 5-year plan this income would be $6,573. If this unit were installed in an area from which it could draw as much as 200,000 bushels of corn, its earning potentialities would be great, even at net margins of less than 10 cents per bushel.

If a separate dump, drag, leg, and bins were added to receive small grains, shelled corn, and soybeans at a handling margin of no more than 6 cents per bushel, but with a capacity for receiving and handling 500 bushels per hour, the earning capacity of this segment of the operation would be substantial. Wheat and oats move to market soon after the June harvest when the corn movement is at its lowest point. This can provide a profitable use for labor and can maintain operation of the elevator, which would otherwise be comparatively idle during this period.

The figures presented show that an efficient elevator has good earning capacity even at comparatively low margins per bushel. The greatest single obstacle to the successful operation of a grain handling facility is the lack of grain to handle. The calculated income potentials of an individual elevator, in many instances, tend to be the major factor leading to its construction, and some elevator builders fail to consider seriously enough the fact that grain must be available each year in substantial volume.

The suggestions about the need for an elevator in local areas have been made with this fact in mind. In no instance was it suggested that a facility was needed unless the data indicated that at least 250,000 bushels of grain per season would be available for the elevator. New facilities were not recommended in an area where the need could be met by improving or expanding existing grain-handling facilities.

One of the most common mistakes made in setting up an efficient grain-handling unit in a specific location is the assumption that, when the elevator is ready for operation, grain will automatically start coming to the elevator in volume. The operator should realize that he must compete for the business. In the coastal plains area the distribution of elevators in 1953 was such that in practically no instance could an elevator have a monopoly of a local grain supply.

The excellent highways available to farmers in trucking their grain to market tend to minimize the factor of hauling distance. Most loads move from farms in comparatively small farm trucks and trailers, especially in the cotton and tobacco section of the area. Corn harvesting and marketing in these areas is done at a time when the demands are not

high for farm work. Under these circumstances, a drive of a few extra miles beyond the first available elevator, to reach another where more satisfactory service is received, may be of little importance to the farmer. Hence, a new elevator must be operated in competition with existing elevators even if they are miles away.

Local farmers who were hauling comparatively long distances before a new unit was established may see no serious handicaps in continuing this arrangement. Therefore, the new unit must offer service at least as attractive to the farmer as has been rendered by other elevators. In most instances such attractive services depend upon management as much as upon the physical equipment. The efficient equipment and facilities make it possible to do a low-cost job of receiving and handling only after the management attracts the farmers' grain to the elevator.

OPPORTUNITIES FOR SUPPLEMENTING THE INCOME OF LOCAL GRAIN ELEVATORS

It has been shown that a relatively small elevator with efficient equipment can be a successful enterprise if it can secure a volume of grain sufficient to keep it operating at a moderate capacity for 90 days or less during the year. In practically no instance will the 90 days of operation be continuous. At times during the heavy marketing season for corn in November and December, it is possible that the deliveries by farmers may be so heavy that the elevator will find it advisable to work as much as 16 hours a day to give good service to farmers. At other times receipts from farmers will be light, with the possibility that in a 30-day period only enough corn will be offered by farmers to operate the elevator the equivalent of four or five 8-hour days at optimum capacity. Most expenses continue during the year, with only the outlay for power to operate the equipment decreasing slightly. Hired labor and management may have nothing to do unless they are receiving grain.

In the principal grain-producing areas in other parts of the United States, country elevators that have been able to keep labor and management busy at some productive work have had an advantage in competition. In seeking profitable outlets for available labor and management in a grain-handling unit in the coastal plains area, the following suggestions may be of value:

If the original installation was a small elevator unit to receive corn from farmers, the installation of a second dump and drag for receiving soybeans, wheat, oats, and any other small grains from farms would probably be advisable. The ear corn dump is not suitable for receiving these small grains. Wheat and oats are usually harvested in June and July when corn receipts will probably be quite low, and all of the equipment and facilities except the ear corn dump and drag can be used to move and store small grains.

Farmers in the coastal plains area purchase substantial amounts of mixed feeds for their livestock. By the installation of a grinder or hammer mill and a feed mixer, and by the stocking of some high-protein feed ingredients, the local elevator would be in a position to grind homegrown grains and to mix feed for farmers on a fee basis. An additional investment of around $3,000 plus the additional expense for power would be necessary for this equipment. With the acquisition of this equipment, an elevator may be able to move into the feed grinding and mixing business in a small way on its own account, if it is located in a section where local farmers purchase considerable quantities of feeds for cattle and hogs.

Grinding corn cobs for sale to feed mixers in other areas may have possibilities. The sale of baled corn husks has been advantageous to certain elevators. The feeding of elevator waste and nonmerchantable grains to hogs and cattle has proved advantageous to many elevators having large sites, where such feeding is not prohibited by local regulations.

In certain locations, new elevators have been built by owners of cotton gins, country hardware or grocery stores, and other local merchants already firmly established in the communities. This type of multiple enterprise allows greater utilization of labor and contributes to a comparatively low-cost operation.

Elevator operators in some locations may see an opportunity to render additional services to farmers by selling farm supplies, equipment, and other types of merchandise. In most sections of the coastal plains area, existing merchandising systems for these items apparently are well established. If an elevator attempts to stock and sell such items, it must compete with existing firms that are in these businesses. The incomes from sideline enterprises of most country elevators in the Corn Belt are greater than their incomes from grain handling. However, in most cases these elevators started the merchandising of these items in their respective communities as pioneers when no other distribution outlets for such items were locally available.

It is suggested, therefore, that unless a new elevator is to be operated in connection with an already existing business, going into sideline merchandising in order to give a profitable outlet for unused labor and management should be approached with caution. Under no circumstances should an elevator be set up with the expectation that the income from sideline merchandising will help pay for it.

In some localities elevators do custom-service work for farmers in grain harvesting. Small grains and soybeans are harvested with elevator-owned combines. It is possible that the use of corn husker-shellers will come into more common use in the tobacco-cotton sections in the future. Most farmers in these sections probably could not afford to own one. Therefore, they will be hired on a custom-service basis. It probably would prove advantageous for a local elevator to be in a position to perform this service.

There could be several advantages in this custom-service harvest work. If the harvesting job is done efficiently and equitably, the elevator could probably have the opportunity to buy the harvested grains to move through the elevator. The grain might be hauled to the elevator in elevator trucks on a fee basis, and these trucks would be able to do an efficient unloading job at the elevator. The farmer would be relieved of all handling operations for which he might have little good equipment, and the harvesting and handling would be done in bulk. From the standpoint of elevator manager, if he does not do this type of work, a competitor may do it and the opportunity may be lost to handle grain from this source.

BENEFITS OF AN EFFICIENT GRAIN MARKETING SYSTEM

Suggestions for the provision of adequate grain-handling facilities are based on the assumption that the benefits derived from the more efficient system must be more than the costs of providing it.

The benefits of an improved grain marketing system, both on-farm and off-farm, are mainly those accruing from more efficient handling and storage practices and from possible rises in price.

Benefits Accruing from More Efficient Handling and Storage Practices

The benefits accruing from the use of new or improved facilities and methods continue as long as the useful life of the facilities. A well-constructed elevator may last for 50 years or longer. Many types of equipment in an elevator may have as much as 20 years of useful life, if adequately maintained. Therefore, in estimating benefits or savings, the longtime use of the facility or method is considered, with no assumption that a facility must pay for itself within a short period of 1, 2, or even 5 years.

The on-farm benefits are mainly the result of preventing deterioration in quality and loss in quantity of grains stored on farms. Damages and losses to grains from such causes as insects, high moisture content, and rodents can be prevented by having proper storage facilities and using them effectively.

The off-farm benefits resulting from the use of efficient receiving, handling, storing, and shipping facilities are mainly in the savings in labor costs. Efficient mechanical equipment and facilities have an operating cost per bushel of grain lower than the cost of the human labor necessary to do the same jobs. The measure of such benefits is in increased grain prices to farmers, or reduced prices to consumers, or both. Such benefits can result from reductions in costs of handling and storage.

Benefits Accruing from Possible Price Rises

The benefits associated with storing grain until a higher price may be secured are less tangible. From the standpoint of the owner and investor in a commercial storage elevator, data indicate that, if the storage income at prevailing rates is to pay for the operation and amortize the investment, an elevator must have at least 400,000 bushels of storage capacity and have a relatively high percentage of yearly occupancy. Since storage rates are essentially competitive, they often cannot be increased by the individual operator. From the standpoint of the owner of the grain in storage, there can be no assurance that the anticipated price rise will always be sufficient to offset his storage costs and allow a profit.

Under the circumstances described, the part played by the Commodity Credit Corporation grain loan programs has a bearing on the situation. Under such loan programs, a grain producer can secure loans on his grain at determined levels if he stores his grain either on or off the farm in facilities adequate to maintain quality. In recent years the loan rate per bushel has usually been above the prevailing level of prices during the heavy marketing season. The intent of this program is to hold the grain off the market during depressed price periods in order to relieve the burden of oversupply and to stiffen the price. Loans made to farmers who store their corn or other grains in off-farm facilities have been limited in the area studied, because suitable off-farm storage facilities have not been available.

Other factors concerning the relationships between Commodity Credit Corporation loan rates and coastal plains grain prices may be significant. Available price data indicate that in periods of downward price trends for corn the spread between Commodity Credit Corporation loan prices and local harvest-time prices tends to be wide. On the other hand, in periods of upward price trends, the spread between the two prices is narrowed and, in some cases, eliminated. Limited observations in the coastal plains area tend to indicate that seasonal changes in prices of corn are getting narrower, primarily because the marketing system is becoming more efficient. Area droughts decrease the yields per acre and the total production, and this situation strengthens local market prices and narrows the spread between grain prices and Commodity Credit Corporation loan rates.

No attempt is made in this study to include the detailed data necessary to show the significance of these factors as they may affect area grain prices and Commodity Credit Corporation loan rate relationships in individual years. However, if the income of a storage elevator is to be derived from renting storage space to producers, it should be emphasized that producers will rent it under the Commodity Credit Corporation warehouse loan program only when it pays them to do so. How much it pays them (or whether it pays them at all) may vary greatly from one year to the next. The significance of these various factors should

have detailed investigation before it can be concluded that, under a continuance of the Commodity Credit Corporation warehouse loan program, a large enough volume of grains will be stored each year to pay the cost of construction and operation of a storage elevator.

Much of the corn moving into commercial channels in the area, following the first month after harvest, has been stored on farms. This corn is stored until the farmers are reasonably sure they will not need it in livestock feeding. Therefore, any storage loan program involving this excess corn could be most economically carried out by using farm storage. The reason is that the capacity of good farm storage facilities necessary to care for the corn fed to livestock could be increased to include sufficient additional capacity to care for the corn that is eventually sold but that is stored at least a few months on the farms. The types of desirable farm facilities that prevent insect and moisture damage are identical for corn fed to livestock and corn destined for sale. As a result, farmers would have on-farm storage facilities and could participate in the Commodity Credit Corporation storage loan program. The cash costs of alternative storage in off-farm warehouses could be used to help pay for the construction of on-farm storage facilities.

Evaluation of Benefits

The overall benfits which will result from the installation and use of off-farm and on-farm facilities for efficient handling, storage, and care of grain in the area are great enough to make the expenditures for such facilities highly profitable.

It is estimated that there is a need in the area studied for additional on-farm facilities to care efficiently for about 30 million bushels of grains, principally corn. Although accurate cost data for such facilities are not available, it is estimated that the cost of the facilities to store such grains would average about 60 cents per bushel. Therefore, an investment of around $18,000,000 in farm facilities would be necessary. It is estimated that the preventable damage is 10 percent of the value of that portion of the total corn crop remaining on farms a month or longer. If 10 percent damage to 30 million bushels of corn (with an estimated value of $1.65 per bushel) stored in inadequate facilities on farms for a month or longer in 1951 could be prevented, a benefit of $4,950,000 would result.

If an investment of around $18,000,000 gave a return of $4,950,000 yearly, the advantage of construction of good on-farm facilities would be unquestionable. In the longtime use of good facilities and practices, an expenditure of as much as $1 per bushel for facilities would be a sound business investment. The damage caused by insects is high, and therefore the benefits from its prevention are also high. The estimate of 10 percent preventable damage caused by insects is conservative; many authorities state that the damage may be as much as 25 percent or more in any year. 2/

2/ Southern Corn Conference on Insects and Diseases, 1951.

The use of the suggested off-farm facilities would contribute to a lower marketing cost. With the increase in efficiency of off-farm facilities to handle and move grain in the area, handling margins in the commercial movement of corn and other grains have narrowed substantially. Dealers with years of experience in the area stated that in former years margins of 25 to 35 cents and more per bushel were common. In 1953, dealers stated that any operator who could be sure of an average margin of 15 cents per bushel was fortunate.

An average decline of 15 cents per bushel in handling margins indicates a saving of around $4,000,000 per year on the approximately 27,000,000 bushels of grain moving from farms in the area in the crop year of 1951. A part of this saving is reflected in an increased income to the farmers who sell the grains. Because of the low-cost methods and facilities in all sections of the area, the increased competition in the commercial grain business may result in a narrower margin in the future than prevailed in 1953.

The storage facilities needed on farms should be of a type that will allow for the drying of corn to prevent moisture damage. No data are available to indicate the extent to which moisture damage has occurred in farm-stored corn. Most recent years have had comparatively dry harvest seasons rather than wet. Opinions expressed by farmers, as well as elevator managers, indicated that in wet years of harvest, moisture damage may be considerable.

With adequate farm storage, the benefits which could accrue to farmers by marketing corn in an orderly manner cannot be accurately calculated, but could be substantial. Under present conditions of storage on farms, the amount of undamaged corn available in the area during the spring and summer is small. Usually the seasonal price rise is marked. As stated previously, around 10,000,000 bushels of corn which is destined for sale is stored on farms for at least a month after harvest. If this amount of corn were to remain in good farm storage until the seasonal rise in prices from the low in December to the following spring was as much as 10 cents per bushel, a benefit of $1,000,000 in increased gross income would result. In most years the seasonal rise in prices between these 2 periods is greater than 10 cents.

From the standpoint of the operator of a grain handling and movement facility, the manager who operates the most efficient elevator is in the best position to meet competition in the marketing system, where the handling margins are becoming narrower. No data are available to give an accurate reflection of the costs of operation with efficient facilities as compared to inefficient facilities. However, managers of certain new, efficient grain elevators stated that in 1953 the possible margins were still high enough that their anticipated profits probably would be sufficient substantially to liquidate the elevator investment before their competition caught up with them. The opinion was expressed that savings in costs of operation made possible by an efficient elevator were great enough to make the investment a successful financial venture.

The prevention of quality deterioration may tend to open up a broader market outlet for corn produced in the area. Processing mills in the southeastern States, major buyers of corn that is produced in the coastal plains area, import large amounts of corn from Middle Western States during the spring and summer. The largest supply of surplus corn available to move off farms in any southeastern State is produced in the coastal plains area. Given reasonably favorable weather conditions, this supply will probably tend to increase in the future.

It is quite probable that this commercial corn, if given adequate care, will have a good market outlet and replace some of the corn which was brought in from the Middle Western States in 1953. It is also probable that, if adequate care is not given to this anticipated expanded production, it may be confronted with declining market outlets. The mills that process for human consumption may not be in a position to accept contaminated or adulterated grain.

APPENDIX

Table 1.--Estimated corn production and utilization by counties, coastal plains area of North Carolina, 1951 crop year

County	Production 1/	Commercial feeds purchased 2/ (Bushel of corn equivalent)	Total supply	Used on farms 3/	Moved from farms
	1,000 bu.	1,000 bu.	1,000 bu.	1,000 bu.	1,000 bu.
Bertie	1,193	108	1,301	1,086	215
Camden	684	25	709	165	544
Chowan	525	92	617	413	204
Currituck	685	93	778	203	575
Dare	---	---	---	---	---
Edgecombe	1,648	147	1,795	1,179	616
Gates	835	115	950	533	417
Halifax	1,282	132	1,414	1,134	280
Hertford	772	55	827	614	213
Martin	1,130	129	1,259	927	332
Nash	1,604	127	1,731	1,156	575
Northampton	1,060	107	1,167	1,038	129
Pasquotank	872	81	953	308	645
Perquimans	871	62	933	430	503
Tyrrell	237	66	303	236	67
Washington	342	60	402	249	153
Beaufort	1,487	162	1,649	644	1,005
Carteret	122	56	178	124	54
Craven	821	99	920	462	458
Greene	1,335	109	1,444	725	719
Hyde	392	38	430	242	188
Johnston	2,795	398	3,193	2,211	982
Jones	762	71	833	454	379
Lenoir	1,932	160	2,092	922	1,170
Pamlico	295	73	368	168	200
Pitt	2,607	220	2,827	1,578	1,249
Wayne	2,389	253	2,642	1,169	1,473
Wilson	1,500	153	1,653	996	657
Bladen	1,120	123	1,243	743	500
Brunswick	312	58	370	370	---
Columbus	1,623	180	1,803	1,019	784
Cumberland	862	163	1,025	659	366
Duplin	2,271	269	2,540	1,347	1,193
Harnett	1,240	86	1,326	792	534
Hoke	299	35	334	261	73
New Hanover	48	82	130	60	70
Onslow	761	92	853	590	263
Pender	586	134	720	517	203

Table 1.—Estimated corn production and utilization by counties, coastal plains area of North Carolina, 1951 crop year—Continued

County	Production 1/	Commercial feeds purchased 2/ (Bushel of corn equivalent)	Total supply	Used on farms 3/	Moved from farms
	1,000 bu.	1,000 bu.	1,000 bu.	1,000 bu.	1,000 bu.
Robeson	2,152	192	2,344	1,251	1,093
Sampson	2,302	276	2,578	1,482	1,096
Franklin	791	110	901	584	317
Granville	649	221	870	487	383
Warren	402	69	471	459	12
Lee	246	114	360	246	114
Wake	1,276	536	1,812	1,079	733
Vance	469	97	566	356	210
Totals	47,586	6,028	53,614	31,668	21,946

1/ North Carolina Agricultural Statistics: Federal State Crop Reporting Service. Preliminary estimates as available May 1952; later revised.

2/ Calculated from U. S. Census data, 1949.

3/ Calculated on basis of numbers of livestock on farms, 1951.

Table 2.--Estimated production of wheat and soybeans and movement from farms of wheat, soybeans, and corn, by counties, coastal plains area of North Carolina, 1951 crop year (1,000 bushels)

County	Production 1/		Movement from farms			
	Wheat	Soybeans	Wheat 2/	Soybeans 3/	Corn 4/	Total corn, wheat, and soybeans
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
Bertie	1	67	---	60	215	275
Camden	1	270	---	243	544	787
Chowan	---	74	---	67	204	271
Currituck	1	285	---	256	575	831
Dare	---	---	---	---	---	---
Edgecombe	28	162	---	146	616	762
Gates	3	48	---	44	417	461
Halifax	48	100	24	91	280	395
Hertford	3	28	---	25	213	238
Martin	1	94	---	85	332	417
Nash	65	67	25	60	575	660
Northampton	23	88	---	79	129	208
Pasquotank	2	367	---	336	645	981
Perquimans	4	357	---	321	503	824
Tyrrell	1	143	---	128	67	195
Washington	---	165	---	149	153	302
Beaufort	14	464	---	418	1,005	1,423
Carteret	2	16	---	15	54	69
Craven	9	59	---	53	458	511
Greene	9	18	---	17	719	736
Hyde	---	346	---	312	188	500
Johnston	78	175	40	157	982	1,179
Jones	7	44	---	39	379	418
Lenoir	32	33	10	30	1,170	1,210
Pamlico	5	132	---	119	200	319
Pitt	16	86	---	77	1,249	1,326
Wayne	63	113	25	102	1,473	1,600
Wilson	54	46	20	42	657	719
Bladen	15	38	---	33	500	533
Brunswick	7	27	---	24	---	24
Columbus	16	61	---	55	784	839
Cumberland	140	148	100	133	366	599
Duplin	33	93	10	74	1,193	1,277
Harnett	114	60	85	54	534	673
Hoke	78	10	50	9	73	132
New Hanover	1	4	---	3	70	73
Onslow	2	35	---	32	263	295
Pender	6	28	---	25	203	228
Robeson	196	36	150	32	1,093	1,275
Sampson	98	206	65	185	1,096	1,346

Table 2.--Estimated production of wheat and soybeans and movement from farms of wheat, soybeans, and corn, by counties, coastal plains area of North Carolina, 1951 crop year (1,000 bushels)--Continued

County	Production 1/		Movement from farms			
	Wheat	Soybeans	Wheat 2/	Soybeans 3/	Corn 4/	Total corn, wheat, and soybeans
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
Franklin	88	19	50	17	317	384
Granville	31	3	—	2	383	385
Warren	92	11	65	10	12	87
Lee	34	6	15	5	114	134
Wake	101	26	60	24	733	817
Vance	36	5	15	5	210	230
Totals	1,558	4,663	809	4,193	21,946	26,948

1/ North Carolina Agricultural Statistics: Federal-State Crop Reporting Service. Preliminary estimates as available May 1952; later revised.

2/ Estimates from grain dealers, county agents, and other local sources.

3/ Calculated approximately 90 percent of production.

4/ From table 1.

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